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UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

*March 10, 2005*

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**APPLICATION NUMBER: 60/498,073**

**FILING DATE: August 27, 2003**

**RELATED PCT APPLICATION NUMBER: PCT/US04/27990**



Certified by

Under Secretary of Commerce  
for Intellectual Property  
and Director of the United States  
Patent and Trademark Office

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Attorney Docket No. 0837RF-H533

In Re Application of:

FRANK B. STAMPS, ET AL.

Serial No: TO BE ASSIGNED

Filed: HEREWITH

For: SOFT IN-PLANE TILTROTOR HUB

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Examiner:

Art Unit:

TRANSMITTAL

**MAIL STOP: PROVISIONAL PATENT APPLICATION**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450

Sir:

Please file the following enclosed documents in the subject application:

1. This Transmittal with Certificate of Express Mail;
2. Provisional Application Cover Sheet;
3. Provisional Application, including two sheets of drawings;
4. Our check in the amount of \$160.00 to cover the Provisional Application Filing Fee; and
5. Our return postcard which we would appreciate you date stamping and returning to us.

"EXPRESS MAIL" No. EV 233938135 US

Date of Deposit: 8/27/03

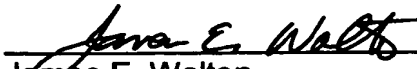
I hereby certify that this paper or fee is being deposited with the United States Postal Service Express Mail "Post Office to Addressee" service under 37 C.F.R. §1.10 on the date indicated above and is addressed to Mail Stop: Provisional Patent Application, Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

By: James E. Walcott

Enclosed is a check in the amount of \$160.00 to cover the Provisional Application Filing Fee. No other fees are deemed to be necessary; however, the Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayments, to Deposit Account No. 502806.

Respectfully submitted,

8/27/03  
Date

  
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ATTORNEY FOR APPLICANTS



08/27/03

## PROVISIONAL APPLICATION COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION under 37 CFR 1.53(b)(2).

		Docket No.	0837RF-H533	Type a plus sign (+) inside	+
INVENTOR(s)/APPLICANT(s)					
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TITLE OF THE INVENTION (280 CHARACTERS MAX)

## SOFT IN-PLANE TILTROTOR HUB

CORRESPONDENCE ADDRESS

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1169 N. Burleson Blvd., Suite 107-328

STATE	Texas	ZIP CODE	76028	COUNTRY	USA
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ENCLOSED APPLICATION PARTS (check all that apply)

- ☒ Specification Number of Pages: 2  
☒ Drawing(s) Number of Sheets: 2

- ☐ Small Entity Statement  
☐ Other (Specify):

METHOD OF PAYMENT (check one)

- ☒ A check or money order is enclosed to cover the Provisional filing fees  
☐ The Commissioner is hereby authorized to charge filing fees  
and credit Deposit Account Number: 502806.

PROVISIONAL FILING FEE AMOUNT

\$160.00

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

☐ No

☒ Yes, the name of the U.S. Government agency and the Government contract number are: NCC2-99086

Respectfully submitted,

By:

James E. Walton  
James E. Walton  
Reg. No.: 47,245

Date:

8/27/03

**SPECIFICATION**

TO ALL WHOM IT MAY CONCERN:

BE IT KNOWN that we, Frank B. Stamps residing in Colleyville, Texas; Michael R. Smith residing in Colleyville, Texas; Christopher M. Bothwell residing in Grapevine, Texas; Lawrence M. Corso residing in North Richland Hills, Texas; James L. Braswell, Jr. residing in Colleyville, Texas; David A. Popelka residing in Colleyville, Texas; Ernst C. Schellhase residing in Fort Worth, Texas; Charles L. Hollimon residing in North Richland Hills, Texas; Thomas J. Newman residing in Maypearl, Texas; Bryan Baskin residing in Arlington, Texas; Thomas C. Campbell residing in Fort Worth, Texas; and Daniel B. Robertson residing in Southlake, Texas; all citizens of the United States of America; have invented a new and useful

**SOFT IN-PLANE TILT ROTOR HUB**

of which the following is a specification.

"EXPRESS MAIL" No. EV 233938135 US
Date of Deposit: <u>8/27/03</u>
I hereby certify that this paper or fee is being deposited with the United States Postal Service Express Mail "Post Office to Addressee" service under 37 C.F.R. §1.10 on the date indicated above and is addressed to Mail Stop: Provisional Patent Application, Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.
By: <u>James E. Walcott</u>

This invention was made with government support under Contract No. NCC2-99086.

Figure 1 is a perspective view of the soft in-plane tiltrotor hub according to the present invention.

Figure 2 is a cross-sectional view of a dual spring rate damper used in the soft in-plane tiltrotor hub of Figure 1.

Referring to Figure 1 in the drawings, a soft in-plane tiltrotor hub 11 for a tiltrotor aircraft according to the present invention is illustrated. Hub 11 provides the desired delta-3, in-plane stiffness, and proprotor stability for a tiltrotor aircraft. Hub 11 allows the use of four or more proprotor blades without the need for active delta-3 or delta-3 mechanisms. An offset flapping hinge 13 and a leading edge pitch horn 15 yield the desired delta-3 while increasing proprotor stability. A fixed chordwise damper 17 provides the required damping for all flight modes of the tiltrotor aircraft.

Referring to Figure 2 in the drawings, damper 17 is illustrated in a cross-sectional view. Damper 17 has two spring rates: a shear spring rate, depicted by reference numeral 22; and a bulge spring rate depicted by reference numeral 24. These spring rates are associated with a plurality of elastomeric springs/seals 25 that support a piston 27 within a housing 29.

Damper 17 includes a primary damping port 19 and a secondary damping port 21 through piston 27 which fluids may pass. A fluid valve 23 is operably associated with primary damping port 19. Fluid valve 23 changes the fluid pressure, thereby changing the spring rate of damper 17 from the shear spring rate to the bulge spring rate.

Dual spring rate damper 17 allows soft in-plane tiltrotor hub 11 to pass through the ground resonance condition.

One advantage of the present invention is that the weight of damper 17 is minimized because the same spring is used to create both the shear spring rate and the bulge spring rate.

# SOFT IN PLANE TILT ROTOR HUB

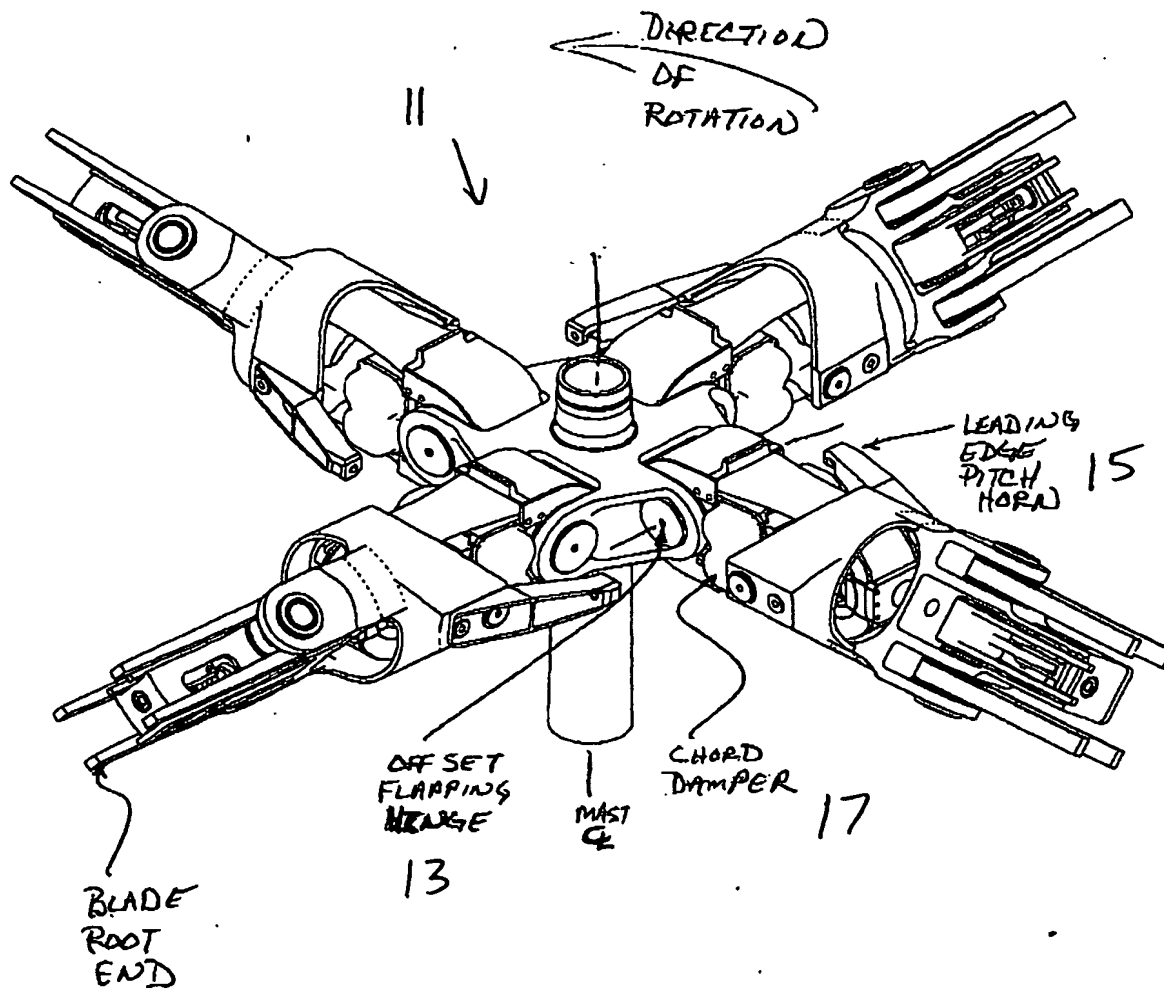
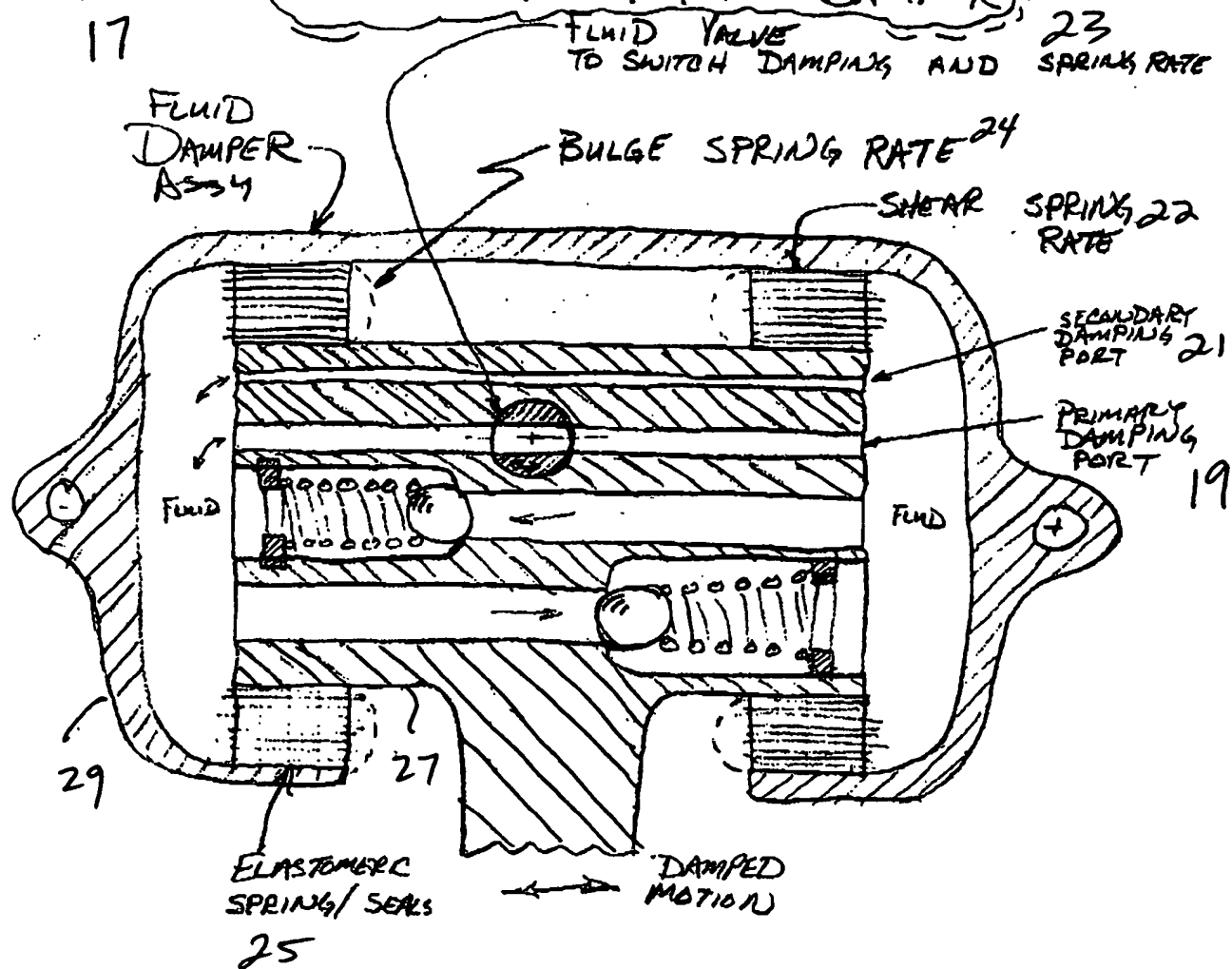


Figure 1

## DUAL SPRING RATE DAMPER



(FIG. 2)



# Document made available under the Patent Cooperation Treaty (PCT)

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Organisation Mondiale de la Propriété Intellectuelle (OMPI) - Genève, Suisse